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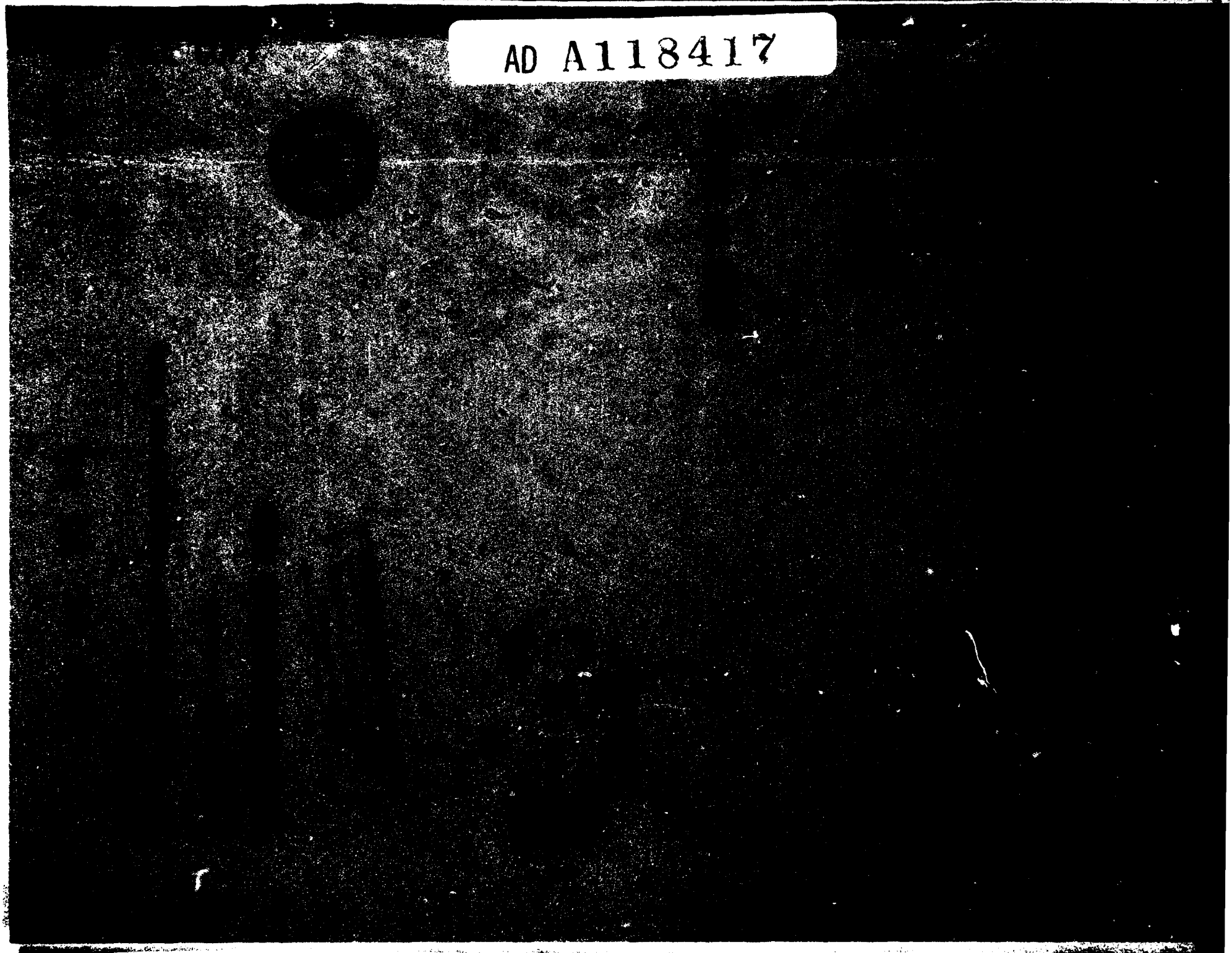

# CARDIAC DISEASE IN THE NAVY AND HOW IT AFFECTS THE THIRD DECADE SAILOR CONCEPT

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## SUMMARY

Enlisted personnel under 35 years of age show low incidence rates of cardiac disease. The incidence rate for personnel over 35 years of age however rises dramatically. The 35-39 age group in the enlisted population has been especially burdensome to the Navy as far as cardiac disease is concerned. Over a 12 year span (1966-1977) the 35-39 age group led all others in the number of days hospitalized (68,141 days). The third decade sailor concept, by increasing the number of older sailors, may magnify the 35> cardiac disease problem. If this proposed extension of naval careers becomes reality, effective preventive measures such as physical fitness programs may be needed to lessen the age-related risks of cardiac disease.

## *INTRODUCTION*

Cardiac disease kills more Americans each year than any other disease, including cancer. It is largely due to the frequent occurrence of cardiac disease that American men rank 21st on a worldwide list of life expectancy.*(1)* Thus, the death toll inflicted by cardiac disease has become a challenge not only to the Navy medical profession, but to society as a whole.

Because of the severity of cardiac disease in the general population and the lack of adequate information concerning cardiac disease incidence in the Navy, this study was undertaken in order to:

- Determine the incidence rate of cardiac disease in the Navy.
- Determine how the incidence of cardiac disease in the Navy may affect the enactment of a third decade sailor concept, i.e., an individual extending a service career beyond 20 years.
- Estimate the cost of cardiac hospitalization for Navy personnel from 1966-1977.
- Discuss the possible implications of physical fitness in relation to cardiac disease prevention in the third decade sailor.

*Characteristics of the Navy Population.*

Because the U. S. Navy represents a selected population from the standpoint of physical fitness, the incidence of cardiac disease in the Navy may not reflect the rate of incidence in the general population. The Navy population differs greatly from the general population in two important factors, male/female ratio and age distribution. For example, over a 12-year span (1966-1977) the enlisted population was approximately 98.5 percent male and 1.5 percent female. The ratio in the officer population was 95.5 percent male and 4.5 percent female. These ratios do not represent the male/female ratio in the general population which is 51.2 percent female and 48.7 percent male.

In regard to age distribution, the Navy is characteristically a youthful organization. For the period 1966-1977 approximately 88.5 percent of the enlisted population and 48.0 percent of the officer population were under 35 years of age* (Table I). In the general population, approximately 33 percent of the people were between the ages of 17-34 for that period.

## *METHODS AND MATERIALS*

Information on cardiac disease incidence was obtained from hospitalization records of active duty Navy personnel admitted for cardiac disease from 1966 to 1977, and was available from the Naval Medical History Data System at the Naval Health Research Center, San Diego, CA. The study population consisted of officer and enlisted personnel of both sexes, divided into ten separate age groups.

The categories of cardiac disease are:

- Acute myocardial infarction**

* Age group populations from Navy military personnel statistics

** NHRC Disease Category Codes

- Acute forms of ischemic heart diseases
- Chronic ischemic heart disease
- Atherosclerosis of coronary arteries
- Myocardial degeneration
- Angina pectoris
- Asymptomatic ischemic heart disease

Overall incidence rates for cardiac disease are based on the number of new cardiac disease cases per 100,000 population over a span of 12 years (1966-1977). Other computations included cardiac disease incidence rates for specific age groups and by year of occurrence. The average number of enlisted personnel on active duty in each occupational category was determined from quarterly reports published in Navy and Marine Corps Personnel Statistics.

*Incidence of Cardiac Disease in the Navy.*

*Age.* Enlisted personnel under 35 show low incidence rates of cardiac disease (Table I). However, over 35 the incidence rate rises dramatically.

In the officer population the incidence rate in the 17-34 age group is again low. Following the trend of the enlisted population, officers over 35 show a much higher incidence for heart disease.

A comparison of enlisted and officer incidence rates for heart disease is shown in Figure 1.

*Sex.* The total Navy male population averages 334.8 $\pm^{*}$ cases of cardiac disease per year (Table II). Over the 12-year span (1966-1977) the incidence of heart disease for males was found to be 58.9 cases per 100,000.

The Navy female population averages only 3.16 $\pm^{**}$ cases of cardiac disease a year. The incidence was found to be 31.0 cases per 100,000.

Women do not greatly affect the total incidence rate of cardiac disease in the Navy (Table II). From 1966 to 1977 women comprised only 1.5 percent of the enlisted population and with an incidence rate of 31.0 cases per 100,000 accounted for only 1.14 heart disease cases per year. Estrogen produced by premenopausal women may offer a measure of protection from cardiac disease.*(2)* Because this potential built-in hormonal protection from heart disease is lost during menopause, increased numbers of third decade women sailors entering menopause may create increased cardiac hospitalization costs.

*The Cost of Cardiac Hospitalization.*

The annual cost of cardiac hospitalization in the Navy runs into the millions of dollars. (Figure 5 lists the estimated total cost of cardiac hospitalization from 1966 to 1977 for male and female personnel.) This cost estimation was derived using \$200-\$250$^{\dagger}$ as the average hospital day cost in the Navy. Discounting the inflation rate therefore, the cost of cardiac hospitalization in 1966 amounted to approximately \$4.2 million (Figure 3). Hospitalization

$^{*}$ Standard deviation (male 67.34)

$^{**}$ Standard deviation (female 1.91)

$^{\dagger}$ Daily hospitalization cost at Naval Regional Medical Center, San Diego, CA

costs reached a peak in 1971 ($7.3 million), but the post-Vietnam War trend has been toward lower costs (1977, $2.05 million). These cost figures should be regarded as general estimates since figures do not take into account the increased costs of specialized cardiac intensive care nor the indirect expenses associated with the hospitalizations.

*Effect of Age.*

The extent of the heart disease problem is magnified for Naval personnel over 35 years of age. Over a 12-year span (1966-1977) the 35-39 age group led all others in the number of days hospitalized (68,141 days). At roughly $200-$250 per day, the cost of hospitalization for this age group totals over $15.8 million. Cost of cardiac disease hospitalization for all enlisted personnel under 35 was approximately $8.9 million.

The third decade sailor concept, by increasing the number of older sailors remaining beyond 20 years, may magnify the over 35 cardiac disease problem. At present incidence rates, an increase of only 10 percent in the over 35 sailor population would create an additional hospitalization cost of about $130,000. This is an increase of approximately 11.8 percent over the 1977 cost estimate of $1.1 million.

The cost of cardiac hospitalization according to age group is provided in Figure 2. The hospitalization cost per person has been shown to increase dramatically with age. This is due to the substantially higher incidence rate of cardiac disease asssociated with advancing age and is not directly associated with the length of cardiac hospitalization that does not consistently increase with age (Figure 4).

*Enlisted vs. Officer Costs for Cardiac Hospitalization.*

The estimated cost of cardiac hospitalization from 1966 to 1977 for enlisted and officers is recorded in Figure 3. The average enlisted cardiac patient spent 69.3 days in the hospital and his cost of cardiac hospitalization was $15.6 thousand. The average officer cardiac patient spent 66.4 days in the hospital and his cost of hospitalization was $14.9 thousand. The length of hospitalization according to age group is listed in Figure 4.

New cardiac rehabilitation programs that get patients out of the hospital faster may be responsible for the reduction in hospitalization costs. In 1972 the average length of hospitalization for enlisted cardiac patients was 88 days. In 1977 the average length of hospitalization had fallen to 27.8 days. This is a good example of how good medical care management can save the Navy millions of dollars per year.

*The Third Decade Sailor.*

Extending normal service careers beyond 20 years has created some intriguing economical questions. Since the incidence of cardiac disease in the Navy has been found to increase with age, what would be the impact of the third decade sailor on cardiac hospitalization costs? Also, what preventive measures could be undertaken by the medical profession to lessen the cost of cardiac hospitalization created by the third decade sailor?

Assuming a sailor enters the Navy at age 18 and serves for 20 years, he would become a third decade sailor at age 38. The 35 to 39 age group has already been found to be an area of increased cardiac disease incidence (218.2 cases per 100,000, Table I).

Creation of a third decade sailor would substantially increase the number of sailors 40 years of age and older. The over 40 enlisted population has been found to have a high incidence rate for cardiac disease (586.4 cases per 100,000). However, the average popu-

lation of enlisted personnel over 40 is only 19,764 and the result is a total of only 116 cardiac cases per year.

If, through the creation of a third decade sailor, the number of sailors 40 years of age and older approached that of 30-year-old sailors (94,508), the estimated number of cardiac disease cases for the older sailors would be approximately 548 per year!

*Physical Fitness and the Impact of the Third Decade Sailor.*

The third decade sailor represents a tremendous resource of talent, experience, and knowledge to the Navy. However, the extension of naval careers may create a number of problems. An older, less physically active population may contribute to an increase of cardiac disease morbidity and mortality. An increased incidence of cardiac disease among older sailors presents not only an economic problem but an operational readiness problem as well. Increased numbers of disabled sailors reduce the potential work output and put additional stress on fleet medical facilities.

In 1976 the estimated cost of lost production in industry due to cardiac disease was about $50 billion.*(3)* Over 132 million workdays are lost annually in the United States due to heart disease.*(4)* The American Heart Association estimates a cost of $700 million per year to replace the 200,000 men aged 45 to 65 years who die or are disabled from coronary disease.

It is clear that if the extension of naval careers becomes reality, effective preventive measures such as physical fitness programs will be needed to lessen the age-related risks of cardiac disease. Physical fitness programs have been widely recommended in the medical literature as a means of reducing the risk of heart disease. One researcher *(5)* has shown a consistent inverse relationship between physical fitness and coronary risk factors (resting heart rate, body fat, serum triglyceride and cholesterol, systolic blood pressure).

A physical fitness program may also have other beneficial effects related to operational readiness and job performance. Raab *(6)* found that a physical fitness program led to a reduction of absenteeism by 68.6 percent for workers with cardiovascular symptoms. Pravosudov *(7)* mentions that workers taking part in physical fitness programs miss fewer days from sickness and the duration of sick leave is shorter. The report also indicates that those who are not physically active are ill five to eight times more often than those involved in the fitness program.

The Navy's only natural resource is her personnel. In a time of conservation awareness, the third decade sailor category represents a reserve of talent and experience that has yet to be fully tapped. Understanding cardiac disease and searching for ways to prevent it or reduce its prevalence among this group will help to insure that the sailor who remains on active duty beyond 20 years will remain a productive member of the Navy work force.

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## TABLE I

### Average Population, Percent of Population, Number of Cardiac Disease Cases and Incidence Rate of Cardiac Disease for Enlisted and Officers Over a Span of Twelve Years (1966-1977)

| 1966-1977 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Enlisted | | | | Officers | | | |
| Age | Average Pop. | Average % Pop. | Average No. CD | Average IR CD | Average Pop. | Average % Pop. | Average No. CD | Average IR CD |
| 17–19 | 68,502 | 12.95% | 2.25 | 3.3 | 0 | 0 | 0 | 0 |
| 20–24 | 268,510 | 50.70% | 7.66 | 2.8 | 4,217 | 8.44% | .33 | 7.8 |
| 25–29 | 77,476 | 14.65% | 9.16 | 11.8 | 9,612 | 19.25% | 1.00 | 10.4 |
| 30–34 | 53,727 | 10.16% | 36.83 | 68.5 | 10,470 | 20.27% | 2.66 | 25.4 |
| 35–39 | 40,781 | 7.71% | 89.00 | 218.2 | 10,572 | 21.18% | 12.50 | 118.2 |
| 40–44 | 13,752 | 2.60% | 57.25 | 416.3 | 8,344 | 16.71% | 21.75 | 260.7 |
| 45–49 | 4,546 | 0.86% | 39.83 | 876.1 | 4,754 | 9.52% | 24.91 | 523.9 |
| 50–54 | 1,066 | 0.20% | 11.25 | 1,055.3 | 1,539 | 3.08% | 10.16 | 660.2 |
| 55–59 | 309 | 0.06% | 5.08 | 1,644.0 | 346 | 0.69% | 2.66 | 768.8 |
| 60 > | 91.5 | 0.017% | 2.50 | 2,732.2 | 73.5 | 0.15% | 1.16 | 1,578.2 |

*Incidence rates are based on the average number of cardiac disease cases per 100,000 population over a span of twelve years (1966-1977).*

## TABLE II

### Average Population, Number of Cardiac Disease Cases and Incidence Rate of Cardiac Disease for Male and Female Enlisted and Officers Over a Span of Twelve Years (1966-1977)

| | Enlisted | | | Officers | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average Pop. | Average No. CDC | Average IRCD | Average Pop. | Average No. CDC | Average IRCD | Average Pop. | Average No. CDC | Average IRCD |
| Male | 520,792 | 259.4 | 49.8 | 47,677 | 75.4 | 158 | 568,469 | 334.8 | 58.9 |
| Female | 7,930 | 1.41 | 17.7 | 2,246 | 1.75 | 78 | 10,176 | 3.16 | 31.0 |
| Total | 528,722 | 260.81 | 49.3 | 49,924 | 77.15 | 154 | 578,645 | 337.96 | 58.4 |

*Incidence rates are based on the average number of cardiac disease cases per 100,000 population over a span of twelve years (1966-1977).*

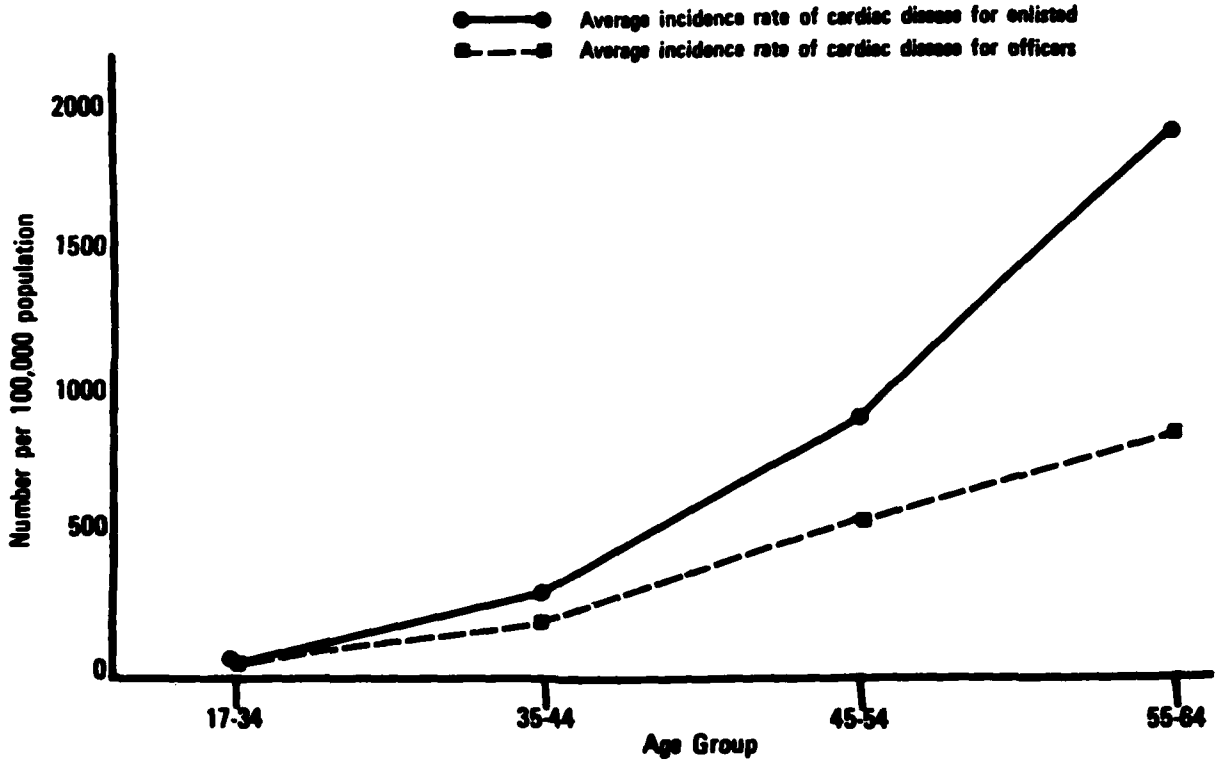


Fig. 1. Incidence rates are based on the average number of cardiac cases per 100,000 population over a span of twelve years (1966-1977).

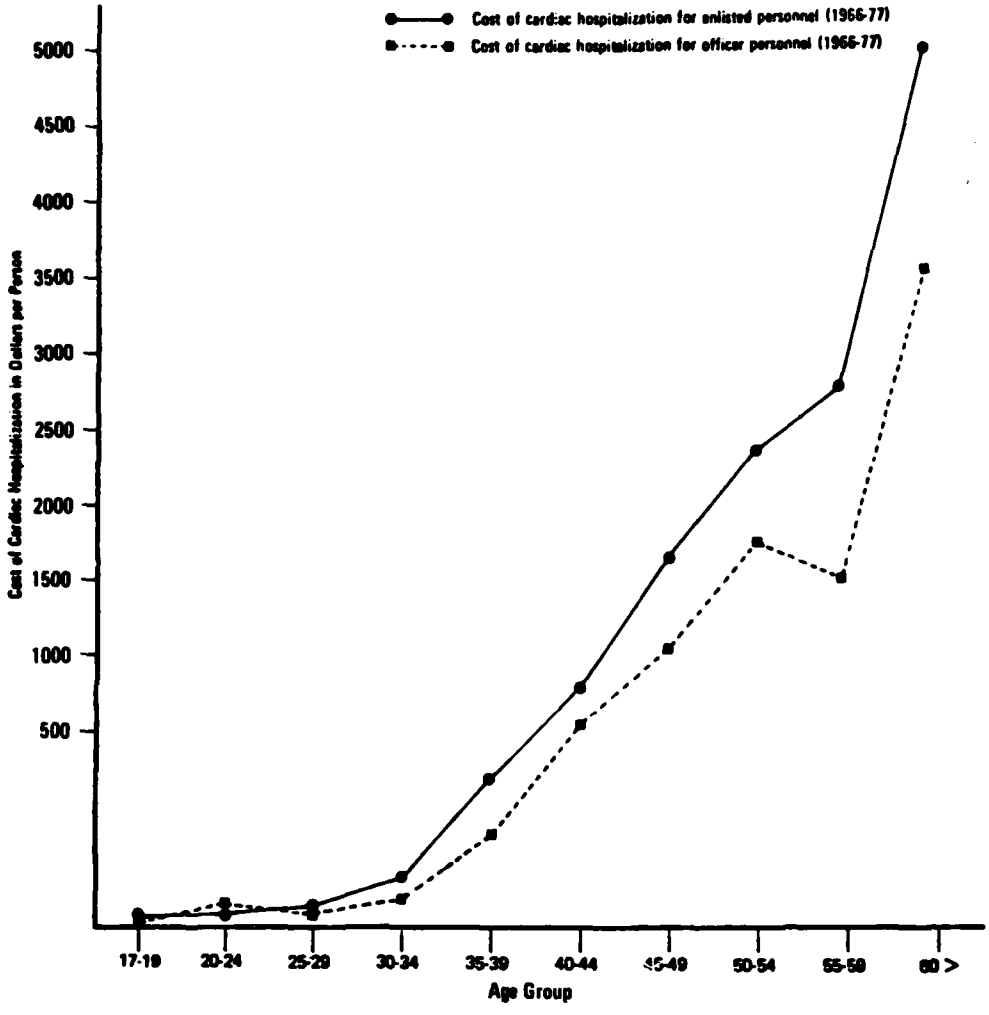


Fig. 2. Cost of cardiac hospitalization per person, determined by dividing total cost of cardiac hospitalization for each age group (1966-77) by average population of that age group.

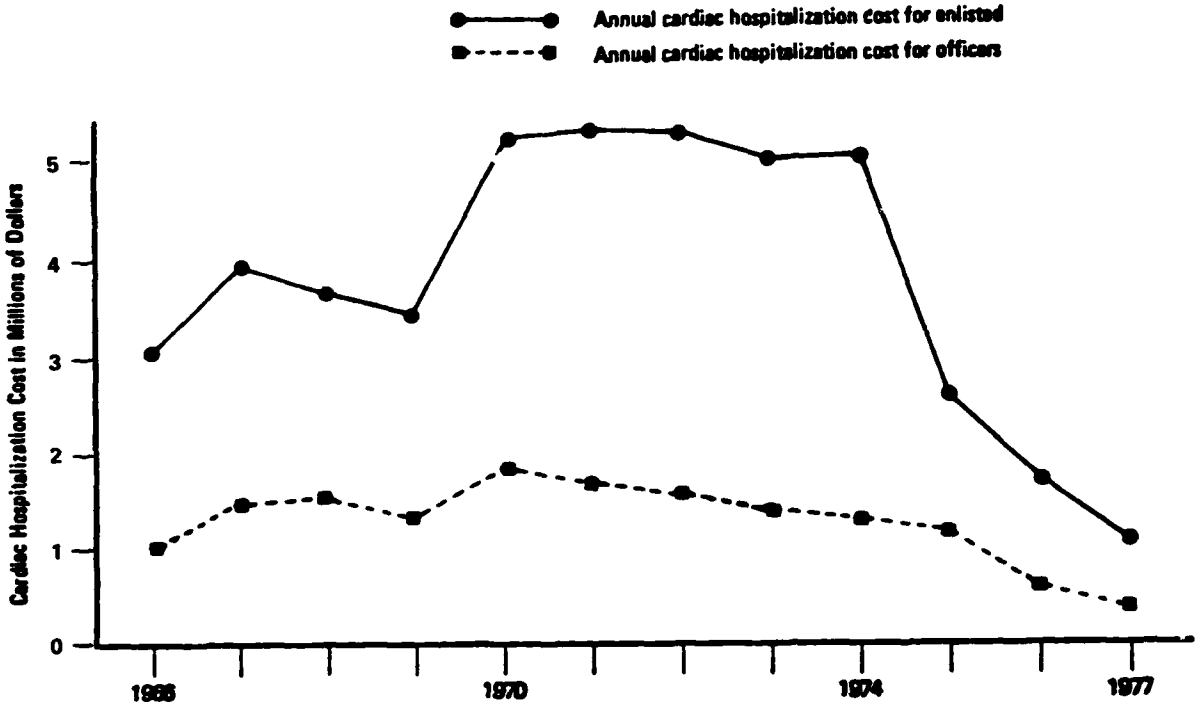
Annual cardiac hospitalization cost for enlisted
Annual cardiac hospitalization cost for officers
Cardiac Hospitalization Cost in Millions of Dollars
0
1
2
3
4
5
1966
1970
1974
1977

Figure 3

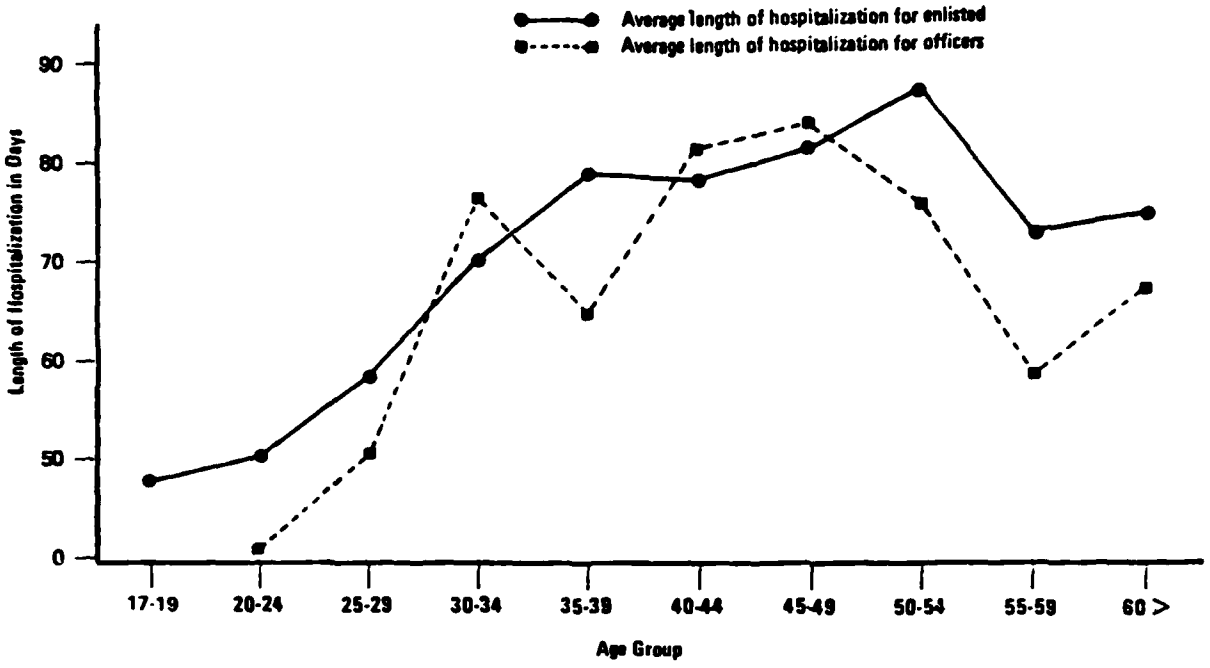


Fig. 4. Average length of hospitalization, determined by dividing total number of days hospitalized for each age group by total number of people hospitalized of that age group.

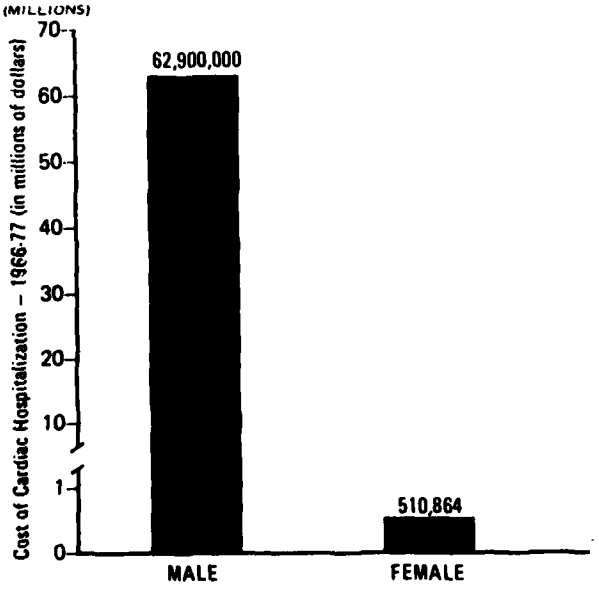


Figure 5

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Physical Fitness

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(U) ... Both enlisted and officers under 35 years of age show low rates of cardiac disease. However, over 35 years of age the incidence rate has been found to rise dramatically in both groups. The creation of a third decade sailor, by increasing the number of sailors over 35 years of age, may create additional costs of cardiac hospitalization. Physical fitness programs have been widely recommended in the medical literature as a means of reducing the risk of cardiac disease. Therefore, a properly designed physical fitness

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program may help to lessen the cost of cardiac hospitalization if the third decade sailor concept becomes reality.


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